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MTARTS - D.H.O.

DATA TRANSFER

DAMAS AND SMITH LTD.

CONSULTING PROFESSIONAL ENGINEERS

TORONTO WINNIPEG



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MTARTS - D.H.O.
DATA TRANSFER



Submitted by:
DAMAS AND SMITH LIMITED
Consulting Engineers
10 Codeco Court,
Don Mills, Ont.

February 22, 1967



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TRANSFER DECISIONS

COMMENTS ON TRANSFER PROBLEMS

There are very likely many statements made concerning data availability or status, which are in error. This fact, however, should only strengthen the evidence of need for many of the examinations suggested. Errors might be due to referring to different sources at different times.

The survey covered 1460 zones of which 914 were internal to the MTARTS Area. For analysis purposes however the 546 external zones were recoded to 31 external zones.

The full trip file contains 242,201 trip records.

An abridged trip file is available containing 204,348 trip records. The difference is the omission of null trips.

We have assumed 7044 (Fortran) programmers to be a more available resource than 1460 programmers. The consequence is that the 7044 becomes a cheaper facility than the 1460, which may not be true otherwise.

EXEC. I is the UNIVAC Multi-processing EXECUTIVE @ \$50/hr.

EXEC. II \$350/hr.

D.H.O. 1450 \$50/hr.

D.H.O. 7044 \$300/hr.

D. & S. 1130 \$30/hr.

R. & S. 1050 \$120/hr.

Most people who have worked on the MTARTS survey are no longer with T.R. C. As a result information on survey and analysis details can be scarce or vague. The best source is possibly W. Henry.

W. Sharpless who has been involved extensively in the more recent analysis is also leaving.

All T.R.C. programs used were written in Fortran IV and likely quite compatible with other Fortran machines.

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All tapes are duplicated once a year (\$90 per tape)

Assuming 16 words = 64 columns for Trips
 8 words = 32 " " D.U.
 5 words = 20 " " Persons
 and 7 trips per household
 3 persons per household

Approximately 2800 interviews would fit on an 1130 disc.

e.g. 1 disc for Toronto Township
 8 discs for the remainder of the study (\$110 per disc)

- No external trips have been or ever could be LINKED the result must mean that there is a difference between the files of trips internal vs external.

24000 interviews taken


23000 interviews on tape

7 card formats per interview	1	person cards (6 persons/card)
	2	single cards
	3	one per trip
	4	one per trip
	5	one per trip
	6	single card
	7	one per trip

Survey tapes available	1	tape for METRO)
	1	tape for the remainder) 3/4 full

Tapes are available representing the condition of the survey after most of the intermediate steps:

e.g. after (a) survey cards to tape
 (b) edit
 (c) Zone correcting
 (d) Linking
 (e) Internal trip extraction
 (f) D.H.O. data merge and re-zoning
 (g) Sorting and reformatting to EXEC. II



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Format conversions were as follows:

card to tape 7 card format before Edit.
 7 to 3 card format - after zone corrections
 3 to 1 card format - after Internal trip Extraction
 EXEC. I to EXEC. II after sorting

COMPUTER SELECTION:

1107 All programs (T.R.C.) are presently in Fortran IV. Programs are relatively interchangeable to and from the 1107. Personnel would be restricted (likely) to D. & S. and T.R.C.

The 1107 would be the most expensive and least accessible machine, with the imminent installation of a UNIVAC 1108 in Toronto - this could improve slightly.

The 1107 (or 1108) would have adequate capacity to handle any job.

1130 Fortran programs - because of core restrictions - reprogramming is generally necessary to make Fortran programs from other machines operational on the 1130. There is no capability of handling tapes - so that once embarked on an 1130 operation (disc) it would be unwise to convert to another machine until the analysis has been completed. Then data can be communicated in large quantities either by shipping discs to a remote location for transfer to tape - or by dumping them onto cards.

1130 is the most accessible machine.

1460 is the only machine which is not Fortran compatible. It is however, about the most inexpensive. Programming would have to be done by D.H.O. personnel.

There are a number of traffic programs currently available on the 1401. BPR has written both an Edit and a Linking Program for a 1401 (1460). Any programs developed now would doubtless be most useful in the future on the 1460.

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7044 Fortran programming

Available - inexpensive - adequate capacity. Personnel could include Damas and Smith and D.H.O. Programs used on the 1107 could likely be converted to the 7044 easily.

Damas and Smith have both an Edit and a Linking Program for the 7044. D.H.O. may or may not have these programs.

BASIC ANALYSIS PROCEDURES

Wherever the opportunity arose, we have changed the order of analysis (from the T.R.C. order).

<u>T.R.C.</u>	<u>NEW</u>
Edit	Edit
Zone Corrections	Zone Corrections
Linking	Expansion
Expansion	Extraction
Extraction	Re-zoning External
Re-zoning External	Re-format
Reformat	Linking

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1. SURVEY TECHNIQUES

The survey techniques should be closely examined and understood.

- For example
- (a) Sampling methods
 - sample selection
 - procedures at vacant households etc.
 - etc.
 - (b) Coding validity
 - relating addresses to zone codes
 - time coding
 - purpose coding
 - etc.
 - (c) Sample adequacy
 - (d) Zoning (re: census tracts)

11 SUPPLEMENT SURVEY

If the sample proves inadequate in one area or another it may be supplemented by data from contemporary surveys (if any exist), or current surveys calibrated to the MTARTS data year.

At this stage, a more complete investigation may be undertaken, for example, a close examination of a 2% sample of interviews from the survey.

12 REDEFINE

If the coding proves unacceptable, it may be necessary to re-process one field or another. This may mean re-reading and recoding the entire survey, or merely adding one or two more criteria to the edit program.

e.g. Zones change from census tract dependence.

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2. EXAMINE EDIT

The Edit was effected with a UNIVAC Fortran program.

An extensive field by field check was made on the data, checking for legal coding and sample compatibility. The program would either:

- (a) accept
- (b) correct, or
- (c) reject a sample, depending on the errors or inconsistencies interpreted.

The editing criteria are contained in a program write-up; these should be closely examined and understood with respect to:

- (a) fields checked
- (b) checking criteria
- (c) correcting (updating) method.
- (d) rejection criteria

A decision would be required at this stage as to whether the edit is acceptable as it stands or not.

Tapes available following the T.R.C. Linking

101	METRO)	
103	MTARTS - METRO)	3 card format

20 RE-SPECIFY EDIT

If the greater part of the Edit program is acceptable and no change of equipment policy might be dictated at 21 or 200, then the minor changes could be inserted with the co-operation of T.R C. programmers, and re-run on the 1107.

If a change of equipment policy decision were made this would dictate a re-programming step, and would lead to decision 21

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If the T.R.C. Edit were "unusable" in the trip and/or dwelling unit data analysis, this must dictate a decision to reprogram (i.e. lead to 21)

A new document on the data Edit specification should result from this step.

21 SOURCE POLICY

A decision is required to use either a tape or card source in subsequent processing. This decision can be cost directed or policy directed. The policy direction might relate to a policy to maintain a card back-up file, or to use some card oriented equipment at a later date, or to use T.R.C. programs where possible etc.

This decision must depend completely on the availability of a "raw data" tape. If one does not exist, this must lead to 230

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3. ZONE CORRECTIONS

It was discovered that many trips and samples had been coded to non-existent zones. This condition was intolerable to some of the subsequent programs, so a zoning correcting program was used to either correct or discard such errors. The criteria for (a) correcting and (b) discarding should be closely examined and understood. (e.g. when an error was found in the origin or destination zone of a trip - was the trip, or sample discarded).

A decision would be required at this point as to the acceptability of the zone correcting program (and product). This decision might be influenced by:

- (a) any intention to re-zone the study area
- (b) the decisions at 4, 5, 6, 7 and 8.
- (c) whether any subsequent changes were made in the zoning in the remainder of the process.

Tapes 105 METRO 107 MTARTS - METRO - available (3 card format)

31 RE-SPECIFY ZONE CORRECTIONS

If subsequent T.R.C. programming at 4, 5, 6 and 7 is largely acceptable and the changes required in the zone correcting program not too severe, this would warrant repairing the T.R.C. program and continuing on the 1107. Otherwise a commitment to extensive re-programming is implied.

32 MACHINE POLICY

A decision is required with respect to the machines intended for use in subsequent analysis. Again, this will be influenced by decisions at 4, 5, 6 and 7 ; and on the other hand the willingness of the E.C.B. to take on the programming requirements.

33 RE-PROGRAM 1107 ZONAL CORRECTIONS

34 RE-RUN 1107 ZONE CORRECTIONS

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4. LINKING

The criteria of linking should be closely examined and understood. Some criteria may be unacceptable in their current form.

- e.g. (a) stop over of up to 20 minutes permissible
- (b) trips linked between automobile and transit nodes coded as transit trips, etc.

The decision concerning the acceptability of the linking program might also be influenced by the analysis procedure desired (e.g. any "unlinked" analysis) and decisions at 5, 6 and 7.

41 RE-SPECIFY LINKING PROGRAM

If subsequent T.R.C. programming at 5, 6 and 7 is largely acceptable, then a path to 44 might be implied. Before deciding on a path leading to 5, however, this would be the appropriate time for a decision concerning 5 and 51 and 6 and 62. . If these indicate a path through 45, then this course should be adopted at 41 rather than later.

42 MACHINE POLICY

The decision with respect to the machinery to be used subsequent to this point is based on the same considerations as 32.

43 RE-PROGRAM 1107 LINKING44 RE-RUN 1107 LINKING45 1050 TAPE TO TAPE

At this time a decision similar to 205 must be made concerning the machinery and programming resources to be used.

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46 PROGRAM AND RUN 1460 - EXPANSION - EXTRACTION

This program would be identical to 206 with the omission of the section dealing with zone corrections

47 PROGRAM AND RUN 7044 - EXPANSION - EXTRACTION

This program would be identical to 207 with the omission of the section dealing with zone corrections.

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5. EXPANSION

Two factors were produced: (1) Dwelling unit
 (2) Trip

The trip expansion factor accounts for under-reporting etc.

The method in which these factors were generated should be closely examined and understood (e. g. were they produced independent of the run which inserted them - how were they verified? On what basis was the trip factor produced).

The decision as to the acceptability of the expansion factor insertion program might also be influenced by :

- (a) intentions of changing study expansion factors.
- (b) decisions 6 and 7.
- (c) whether any subsequent changes were made to the factors or the factoring method.

A copy of the METRO portion of the survey was taken at this point, and released to Voorhees.

Tapes available	108	METRO 84,000 sets)	
	111	MTARTS-METRO 75,000 sets)		3 card image
	1001	Home Zone)		
	1003	O. D.)	Sort	(1 card image of all data)
			Note - these might be after extraction	(6)

51. RE-SPECIFY EXPANSION

If more than a slight respecification is necessary in the Expansion program, then this should lead back to 45.

52. RE-RUN EXPANSION

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6. INTERNAL TRIP EXTRACTION

All trips with an external origin were extracted. Thus the population of trips also surveyed by D.H.O. was eliminated. At the same time the data format was reduced from a 3 card image to a one card image.

The decision concerning the acceptability of this program might also be influenced by:

- (a) any intention to analyse external data picked up in the Home Interview survey.
- (b) decision 7.
- (c) A requirement for some of the data dropped in the format change.

Tapes available 1015 "All" externals, OD sort
 1013 All trips, OD sort)
 1038 (All trips Home sort) 1 card image
 (External Zones recoded)

61 RESPECIFY TRIP EXTRACTION

If more than a slight re-specification is involved with the internal trip extraction program, then this should lead back to 45.

62 RE-RUN 1107 INTERNAL TRIP EXTRACTION

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7. D.H.O. EXTERNAL TRIPS

The compatability of D.H.O. and TRC surveys should be closely studied and understood with respect to:

- (a) dates and locations.
- (b) sampled set (eg: transit trips etc.)
- (c) factoring methods.
- (d) coding conversion (eg: purpose, mode, time of day, etc.)
- (e) definitions of (serve passenger trip.
(vehicle loading, etc.

71 SUPPLEMENT D.H.O. EXTERNAL SURVEY

If the sample proves inadequate in one area or another, it may be supplemented by data from contemporary surveys (if any exist), or current surveys calibrated to the appropriate data year.

At this stage a more complete investigation may be undertaken of coding compatability.

72 RE-DEFINE D.H.O. EXTERNAL SURVEY

As a result of the examination at 71 and 7 some coding definitions may be altered - or zoning boundaries may be moved etc.

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81 MERGE EXTERNAL - RE-ZONING

When merging with the T.R.C. file - the external zones used in the survey were recoded to 31 external zones. Also the format of the D.H.O. cards was changed to coincide with the T.R.C. 1 card format; since the data sets are not entirely compatible a number of blank fields exist in the external trip records.

At this point the trip file was considered complete. As far as an independent O.D. analysis is concerned there were no T.R.C. 1107 programs used on the data subsequent to this point which would not be readily available on any other machine (e.g. O.D. Analysis).

The complete trip card file consists of 242,201 trip records coded to 914 internal and 31 external zones. Also produced at this point was a 204,348 trip record tape for special analysis purposes, which omitted all null trip data.

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9. EXAMINE SORT

The EXEC I tape produced in steps 1 - 8 was sorted 3 different ways and 3 EXEC II tapes produced.

- (a) sort by origin zone.
- (b) sort by destination zone.
- (c) sort by interview zone.

The requirements of the D.H.O. Basic Analysis program will determine the advantage of using the output from this step. If a completely different sort is required then this step would likely be (neglected) by-passed. If the destination sort were required and an origin sort were required in addition, then the value of the output depends on decisions 100

Tapes Available

181 All trips OD sort)
194 All trips DO sort) 1 card image

91. 1050 TAPE TO TAPE

Same as 202

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100 FORMAT REQUIREMENT FOR BASIC ANALYSIS PROGRAM

If a format change is required, one option open would be to reprogram the Basic Analysis program possibly saving the time and cost of negative decisions at 9 and 102 (making the Basic Analysis program a more general and more useful program).

If the B.A. program is unchanged, this could lead to 226 through 91

104 TAPE TO CARD

This step would only be undertaken if the Basic Analysis program required card input (in an available sort). If the 1130 were to be used for any analysis on the trip file at a later date, it would be necessary to do a tape to card run.

This tape to card run could be most economically done on the 1107.

105 TAPE TO TAPE

This would require one or two conversion programs on the 1107 and one on the 1050.

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200 TAPE SOURCE

A decision is required at this point with respect to the machines to be used in subsequent processing. This will be influenced by possible decisions at 3, 4, 5, 6 and 7; negative decisions on many of these (particularly the first two) would likely lead to a decision to use D.H.O. Equipment and therefore lead to 202.

Any decision leading to 202 implies a D.H.O. intention to do a considerable amount of programming and probably a considerable amount of program design. Much of the cost and time involved under these circumstances depend on (a) the internal priority of the Data Transfer (b) the concern for generalizing programs with respect to usage and machine.

201 RE-RUN EDIT

Depending on the extent of the revisions outlined in 20 and/or 21 there would be some programming effort involved in this process. The reprogramming responsibility is not clear as it would involve a TRC program on a METRO machine with MTARTS data for D.H.O.

202 1050 TAPE TO TAPE

This process is required as a result of the decisions at 21 and 200 .

Subsequent to the process a decision is required with respect to a D.H.O. Edit program. A number of different Edit versions are available: D & S, TRC, BPR (HEEP). Any one of these could be modified and put on the 7044 at a relatively small investment. The Edit function more properly belongs on the 1460, however, and it might be decided to spend a greater amount on the programming to achieve a cheaper running program. In order to make this decision some review of the available programs should be made - particularly the possibility of using the BPR 1401 program.

203 PROGRAM & RUN 1460 EDIT

Obtain program sources
Program analysis.
Programming.
Run Edit.

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204 PROGRAM & RUN 7044 EDIT PROGRAM

Obtain program sources
 Program analysis
 Programming
 Run Edit.

205 SPECIFICATIONS FOR EXTRACTION ETC.

A decision is required at this point similar to the decision at 202 i.e., whether to program the expansion extraction and rezoning on the 1460 on the 7044. Again this is properly a 1460 function; however, it would be a difficult application for which to write a general program; and since programmers are more readily available for the 7044, it would likely be cheaper to program on the 7044. This program would likely be a "one-off" proposition.

The data acquisition phase should be completed at this time.

- (a) Compile Expansion factors.
- (b) Compile Extraction specifications
- (c) Compile Rezoning data.

The specifications for Expansion, Extraction, and re-zoning should be issued at this time.

<u>206 PROGRAM & RUN 1460</u>	EXPANSION EXTRACTION RE ZONING
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Programming
 Test
 Run data through program.

<u>207 PROGRAM & RUN 7044</u>	EXPANSION EXTRACTION RE ZONING
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Programming
 Test
 Run data through program.

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208 SPECIFICATIONS FOR LINKING

A decision similar to 202 is again required, concerning the LINKING program. While this program would probably be more efficient on the 1460, there are again better and more available resources with respect to the 7044. TRC and D & S have working versions of a Linking program in Fortran. These could be easily modified for use on the 7044. Some degree of generality can be introduced into these programs to make them useful to the D.H.O. traffic library.

At this time also the specifications for the linking should be defined.

209 PROGRAM & RUN 1460 LINKING PROGRAM

Compile programming sources.

Programming.

Run Linking

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210 PROGRAM & RUN 7044 LINKING PROGRAM

Compile programming sources
Programming
Run Linking

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220 D.H.O. EXTERNAL SURVEY

This is the same step as 7 with 71 and 72 as options.

221 SPECIFICATIONS FOR FACTORING ETC.

A decision is required here similar to 202. There might be some advantage to programming the RE ZONING REFORMATING and FACTORING on the 1460, to use a card source giving tape output. The merge with the Internal data would then be done with the SORT on the 7044. On the other hand, if this were made a "one-off" program, it would be much easier to prepare on the 7044.

At this time the preparation of data for recording the External zones and reformatting should be completed, the factoring defined, and a set of specifications or procedures published.

222 PROGRAM & RUN 1460 EXTERNAL REZONE
 REFORMAT
 FACTOR

Program

Run Program -(card input)
 tape output

223 PROGRAM & RUN 7044 EXTERNAL REZONING
 REFORMAT
 FACTOR

Programming

Card to tape 1460

Run program

224 7044 SORT/MERGE

The 7044 System sort can be used to prepare the tape data as input for the Basic Analysis program. If a merge is necessary it can be done at this time also.

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225 BASIC ANALYSIS PROGRAM

A decision is required concerning the Basic Analysis program with respect to two extensions :

- (a) input data form (accept tape)
- (b) input data format (accept multiple format)

If the B.A. program is rewritten to handle one of the extensions it could also be amended to handle the other extension at the same time.

Extension (a) would be an important generalization of the Basic analysis program.

Extension (a) alone leads to 227

Extension (b) or no extension leads to 226

Extension (a) and (b) leads directly to Basic Analysis through 228.

226 TAPE TO CARD - REFORMAT

The reformatting is necessary if the Basic Analysis program does not handle multiple formats. The reformatting should be done on the 1460 at TAPE to CARD time; but the reformatting would be more easily programmed for the 7044 and then a standard tape to card routine used on the 1460.

227 TAPE REFORMAT

This could be programmed for either the 1460 or 7044. It would likely be cheaper to program for the 7044.

230 MACHINE POLICY

A decision is required at this point with respect to the systems which will subsequently used. If the extensive programming commitments are taken on by D.H.O., this would lead to 231 . If it were decided to do the programming on the more accessible 1130, however, this would lead to 240 . Many of the considerations applicable at 200 are relevant here.

231 PROGRAM & RUN 1460 CARD TO TAPE
EDIT

This would be a process identical to 203 with the added provision in the EDIT program, that the input be in card form. This would become a useful D.H.O. traffic library program.

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240 PROGRAM AND RUN 1130 EDIT
ZONE CORRECTIONS
EXPANSION
EXTRACTION
RE-ZONING
REFORMAT

Much of the programming required is available at Damas and Smith and will require only a conversion effort.

241 MACHINE POLICY

A decision is required concerning the subsequent path.

Any decision to base 1460 programs on card input, or to maintain a card back-up file will lead to 242.

Any decision to revert to D.H.O programming and computers other than a card based 1460 linking program will lead to 243.

Any intention to do further analysis on the 1130 system will lead to 244.

242 DISC TO CARD

243 DISC TO TAPE

This will require transporting the appropriate discs to some other 1130 location.

244 PROGRAM & RUN 1130 LINKING

A linking program exists at Damas & Smith. This could be reprogrammed according to the required specifications.

Linking Specifications must be published at this time.

245 D.H.O. EXTERNAL SURVEY

This is the same step as 7 with 71 and 72 as options.

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246 MACHINE POLICY

A decision similar to 241 is required.

Unless a card back-up file were required, any decision leading to 248 would not be economic.

247 DISC TO TAPE

Same as 243

248 DISC TO CARD

Same as 242

249 PROGRAM & RUN 1130 EXTERNAL RE-ZONE
FACTOR
MERGE

Define re-zoning data
Define factors
Publish specifications.

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250 BASIC ANALYSIS PROGRAM

A decision similar to 225 is required.

251 PROGRAM & RUN 1130 DISC TO TAPE
SORT
REFORMAT

With the Random Access storage device, the sort can be combined with this final process.

252 PROGRAM & RUN 1130 DISC TO CARD
SORT
REFORMAT

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BUDGET ESTIMATES

BUDGET ESTIMATES

1.

1. SURVEY TECHNIQUES

1-3	conference units	\$200 - \$600		
1-3	technical man weeks	\$250 - \$750		
			\$450	\$1350

11 SUPPLEMENT SURVEY

Supplement with 2% of cost of entire survey	\$2000		
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Close examination	1 conference unit	\$200		
	5% survey cost	\$500		
			\$700	\$2700

12 REDEFINE \$100 - \$100002 EDIT

1-3	conference units	\$200 - \$600		
1-2	technical man weeks	\$250 - \$500		
			\$450	\$1100

2 RE-SPECIFY EDIT

1 conference unit				\$200
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21 SOURCE POLICY

1 conference unit				\$200
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3 ZONE CORRECTIONS

1-3	Conference units	\$200 - \$600		
1-3	Technical man weeks	\$250 - \$750		
			\$450	\$1350

31 RE-SPECIFY ZONE CORRECTIONS

1	Conference unit	\$200		
3-5	technical man weeks	\$750 - \$1250	\$950	\$1450

32 MACHINE DECISION

1	conference unit	\$200		\$200
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33 REPROGRAM 1107 ZONAL CORRECTIONS

2-5	programmer units	\$250 - \$1250		
2-3	hours of 1107 (Exec I)	\$100 - \$150	\$350	\$1400

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<u>34</u>	<u>RE-RUN EDIT 2 hours (Exec I) 1107</u>			\$100
	202 1050 tape to tape			
	2. programming units	\$500		
	1. hour 1107 (Exec I)	\$50		
	2-3 hours 1050	\$250 - \$375	\$800	\$925
<u>4</u>	<u>LINKING</u>			
	1 conference unit	\$200		
	1 - 4 technical man weeks	\$250 - \$1000	\$450	\$1200
<u>41</u>	<u>RESPECIFY LINKING PROGRAM</u>			
	1 conference unit	\$200		
	1 - 2 programming units	\$250 - \$500	\$450	\$700
<u>42</u>	<u>MACHINERY</u>			
	1 conference unit			\$200
<u>43</u>	<u>REPROGRAM 1107 LINKING</u>			
	2-3 programming units	\$500 - \$750		
	2-3 1107 (Exec I) hours	\$100 - \$150	\$600	\$900
<u>44</u>	<u>RE-RUN 1107 LINKING</u>			
	2 hours 1107 (Exec I)			\$100
<u>45</u>	<u>1050 TAPE TO TAPE</u>			
	same as 202		\$800	\$925
<u>46</u>	<u>PROGRAM AND RE-RUN 1460 EXPANSION, EXTRACTION</u>			
	3-4 programming units	\$750 - \$1000		
	2-3 hours 1460 test	\$100 - \$150		
	2 hours 1460 running	\$100	\$950	\$1250
<u>47</u>	<u>PROGRAM AND RUN 7044 EXPANSION, EXTRACTION</u>			
	2-3 programming units	\$500 - \$750		
	(1-2 programming units using 1130	\$250 - \$500)		
	1-2 hours 7044 test time	\$300 - \$600		
	(2-3 hours 1130 test time if used	\$60 - \$90)		
	2 hours 7044 running	\$600	\$910	\$1950

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<u>5 EXPANSION</u>				
	2-4 conference units	\$200 - \$800		
	1-5 technical man weeks	\$250 - \$1250	\$450	\$2050
<u>51 MACHINE POLICY DECISION</u>				
	1 conference unit	\$200		
	(1 technical man week)	(\$250)	\$200	\$450
<u>52 RE-RUN EXPANSION 2 hours 1107 (Exec I)</u>				
				\$100
<u>6 INTERNAL TRIP EXTRACTION</u>				
	1 conference unit	\$200		
	(1 technical man week)	\$250	\$200	\$450
<u>61 RESPECIFICATION</u>				
	1 technical man week			\$250
<u>62 RE-RUN 1107 TRIP EXTRACTION</u>				
	2 hours 1107 (Exec I)			\$100
<u>7 D.H.O. EXTERNAL TRIPS</u>				
	1-3 conference units	\$200 - \$600		
	1-4 technical man weeks	\$250 - \$1000	\$450	\$1600
<u>71 SUPPLEMENT D.H.O. SURVEY</u>				
	1% - 10% of survey cost		\$500	\$5000
<u>72 REDEFINE D.H.O. CODING</u>				
	2% - 5% of survey cost		\$1000	\$2500
<u>200 TAPE SOURCE</u>				
	1 conference unit			\$200
<u>201 REPROGRAM RE-RUN EDIT</u>				
	2 programming units	\$250 - \$500		
	1 hour 1107 test time)	\$50		
	2 hours 1107 run time) Exec.I	\$100	\$400	\$650
<u>202 1050 TAPE TO TAPE</u>				
	2 programming units	\$500		
	1 hour 1107 (Exec I)	\$50		
	2-3 hours 1050	\$250 - \$375	\$800	\$925

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203 PROGRAM AND RUN 1460 EDIT

3-6 programming units	\$750 - \$1250		
2-3 hours 1460 test time	\$100 - \$150		
2 hours 1460 running	\$100	\$950	\$1500

204 PROGRAM AND RUN 7044 EDIT

2-3 programming units	\$500 - \$750		
(1-2 programming units using 1130) (\$250 - \$500)			
1-2 hours 7044 test time	\$300 - \$600		
(2-3 1130 hours test time)	(\$60 - \$90)		
2 hours 7044 run time	\$600	\$910	\$1950

205 1460 - 7044 MACHINE EXTRACTION ETC. SPECIFICATIONS '

1 conference unit	\$200		
1 - 6 technical man weeks	\$250 - \$1500	\$450	\$1700

206 PROGRAM AND RUN 1460 EXPANSION EXTRACTION AND REZONING

2-5 programming units	\$500 - \$1250		
1-2 1460 test hours	\$50 - \$100		
2 hours 1460 run time	\$100	\$650	\$1450

207 PROGRAM AND RUN 7044 EXPANSION EXTRACTION AND REZONING

1-2 programming units	\$250 - \$500		
(1 programming unit using 1130) (\$250)			
1 hour 7044 test time	\$300		
(2 hours 1130 test time)	(\$60)		
2 hours 7044 running time	\$600	\$910	\$1400

208 LINKING

1-2 conference units	\$200 - \$400		
1 programming unit	\$250	\$450	\$650

209 PROGRAM AND RUN 1460 LINKING PROGRAM

2-6 programming units	\$500 - \$1500		
2-3 1460 test hours	\$100 - \$150		
2 hours 1460 run	\$100	\$700	\$1750

February 22, 1967.

220 PROGRAM AND RUN 7044 LINKING

2-3 programming units	\$500 - \$750		
(1-2 programming units using 1130)	\$250 - \$500)		
1-2 hours 7044 test hours	\$300 - \$600		
(2-3 1130 test hours)	(\$60 - \$90)		
2 hours 7044 run	\$600	\$910	\$1950

220 D.H.O. EXTERNAL SURVEY

same as 7		\$450	\$9100
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221 MACHINE DECISION FOR MERGE-FACTOR REZONE EXTERNAL

1 conference unit	\$200		
1-2 technical man weeks	\$250 - \$500	\$450	\$700

222 PROGRAM AND RUN 1460 EXTERNAL REZONE
REFORMAT AND FACTOR

3-4 programming units	\$750 - \$1000		
1-2 hours 1460 test time	\$50 - \$100		
1 hour 1460 run time	\$50	\$850	\$1150

223 PROGRAM AND RUN 7044 EXTERNAL REZONE
REFORMAT AND FACTOR

2-3 programming units	\$500 - \$750		
(1-2 programming units using 1130)	(\$250 - \$500)		
1-2 hours 7044 test time	\$300 - \$600		
(2-3 hours 1130 test time)	(\$60 - \$90)		
1 hour 7044 run	\$300	\$610	\$1650

224 7044 SORT MERGE

3 hours 7044 time			\$900
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225 BASIC ANALYSIS PROGRAM DECISION

1 conference unit			\$200
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226 TAPE TO CARD REFORMAT

1 programming unit	\$200		
20 hours 1460 run time	\$1000		
cards	\$300		\$1500

227 TAPE REFORMAT

1 programming unit	\$200		
2 hours 7044 run time	\$600		\$800

228 REPROGRAM BASIC ANALYSIS

1-2 programming units	\$200 \$400	\$200	\$400
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230 MACHINERY DECISION FOR EDIT

1 conference unit			\$200
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<u>231 CARD TO TAPE 1460</u>	20 hours		\$1000
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232 PROGRAM AND RUN 1460 EDIT

same as 203		\$950	\$1500
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240 PROGRAM AND RUN 1130 EDIT, ZONE CORRECTIONS,
EXPANSION, EXTRACTION, REZONING, REFORMAT

3-4 programming units	\$750 - \$100		
3-4 hours test time	\$90 - \$120		
discs	\$1000		
20-60 hours 1130 run time	\$600 - \$1800	\$2450	\$3020

241 MACHINE DECISION FOR LINKING

1 conference unit			\$200
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242 DISC TO CARD

60 hours 1130 run time	\$1800		
cards	\$300		\$2300

243 DISC TO TAPE 4 hours 1130 run time \$120

244 PROGRAM AND RUN 1130 LINKING

1-2 programming units	\$250 - \$500		
2-3 hours test times	\$60 - \$90		
4 hours 1130 run time	\$120	\$430	\$710

245 D. H. O. EXTERNAL SURVEY

same as 7		\$450	\$9100
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246 MACHINE DECISION FOR EXTERNAL MERGING

1 conference unit			\$200
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247 DISC TO TAPE

same as 243			\$120
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248 DISC TO CARD

same as 242			\$2100
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249 PROGRAM AND RUN 1130 EXTERNAL REZONE
FACTOR AND MERGE

1-2 programming units	\$250 - \$500		
2-3 hours 1130 test	\$60 - \$90		
2 hours 1130 run time	\$60	\$370	\$650

250 BASIC ANALYSIS DECISION

1 conference unit			\$200
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251 PROGRAM AND RUN 1130 DISC TO TAPE
SORT AND REFORMAT

1 programming unit	\$250		
1 hour test time	\$30		
6 hours 1130 run time	\$180		\$460

252 PROGRAM AND RUN 1130 DISC TO CARD
SORT AND REFORMAT

1 programming unit	\$250	
1 hour test time	\$30	
60 hours run time	\$1800	
card cost	\$300	\$2380

253

Same as 228	\$200	\$400
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Diagram illustrating a project network structure. The network is represented by a rectangular box divided into sections. The top-left section is labeled "ACTIVITY NUMBER". The top-right section is labeled "DURATION (WEEKS)". The bottom-right section is labeled "COST INDEX (BASE x 1 CONFERENCE)".

Legend:

- LEAST TIME PATHS
- LEAST COST PATHS

[illegible]

MTARTS-D.H.O. DATA TRANSFER
DECISION NETWORK

6701-B-001

OUT CARD

Damas & Smith Ltd.

[illegible]

FORM SB-OS-35
2M-65-645

**DEPARTMENT OF HIGHWAYS
ONTARIO**

FILE No. _____

REMARKS _____

DATE _____

